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Physical activity behaviours in school-going adolescents in the Western Cape Province, South Africa

**A Minor Thesis
Presented to**



The University of Cape Town

In partial fulfillment of
The requirements of the
Masters of Public Health Degree

By

Nasheen Naidoo

Supervisors

Professor SL Amosun

School of Health & Rehabilitation Sciences
Faculty of Health Sciences
University of Cape Town

Professor SP Reddy

Director: National Health Promotion Research & Development Unit
Medical Research Council
South Africa

ABSTRACT

Adolescent obesity in South Africa is on an upward trend with physical inactivity being one of the main contributing factors. The first National Youth Risk Behaviour Survey (YRBS 1) was administered to 188 public schools involving 10,699 learners in Grades 8-11 in 2002 and explored clusters of behaviours including physical activity behaviours. The second YRBS (YRBS 2) was conducted in late 2008 and the current study analysed a subset of the data collected from the Western Cape province.

The aims of this study were (a) to determine the prevalence of self-reported physical activity behaviours among adolescents in Grades 8-11 in Western Cape public schools from the YRBS 2, (b) to determine if there were statistically significant differences in these behaviours in comparison to the YRBS 1 and (c) to identify the characteristics of physically inactive participants.

The study design was a cross sectional national prevalence school-based quantitative survey and focused on the results from Grade 8-11 classes in public secondary schools sampled in the Western Cape Province only. A total of 1134 students were surveyed across 22 schools.

Results of the study showed significantly younger learners (mean 15.4 years vs 16.2 years; $p<0.001$) than in the YRBS 1. From the comparative analysis between YRBS 2 and YRBS 1, (a) more learners did not participate in vigorous (37% vs 35%; $p=0.32$) and moderate (29% vs 23.3%; $p=0.001$) activities in the previous 7 days, (b) fewer learners did not have access to equipment/sporting grounds/gyms for physical activity (3.8% vs 6.7%; $p=0.001$), (c) more learners spent 2-4 hours/day watching TV/playing video games and (d) fewer learners did not have PE classes (28.6% vs 47.0%; $p<0.001$).

A stratified analysis of individual, psychosocial, socioeconomic, environmental and other health risk behaviour variables by physically inactive ($n=432$) and physically active ($n=764$) participants in YRBS 2 revealed that the statistically significant characteristics of the physically inactive group included: being female, feeling sad/hopeless and having consulted a professional, perceiving themselves as overweight and admitting to not doing anything about it, living in an urban/peri-urban area, having no PE classes at school, watching TV/playing computer games <1hr/day and having smoked cigarettes for 1 or more days in a month.

The main conclusion from this study was that fewer adolescents in Grade 8-11 in the selected public schools in the Western Cape in 2008 participated in vigorous and moderate physical activity within the previous 7 days than adolescents in 2002. Environmental determinants such as school PE classes and TV watching/video game playing; and socioeconomic status determinants such as living in an urban area, appeared to have the strongest influence on physical inactivity among these adolescents and could thus be potential target areas for future interventions to improve physical activity behaviours of this target group.

Acknowledgement

This study was made possible by the assistance and efforts from the Health Promotion Research and Development Unit, Medical Research Council of South Africa.

The support and supervision from Professor SL Amosun and his keen insights.

Professor SP Reddy as co-supervisor and Principal Investigator of both YRBS studies whose support was greatly appreciated and vital to the completion of this report.

To all participants for their time and enthusiasm.

My family and friends who have supported me through this period.

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3. This report is my own work.
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PART A: Protocol

Physical activity behaviours in school-going adolescents in the Western Cape Province, South Africa

A proposal for a mini-thesis as a partial requirement

For the degree of Masters of Public Health,

University of Cape Town

Nasheen Naidoo

NDXNAS001

2011

Supervisors

Prof SL Amosun
Department of Health & Rehabilitation Sciences
Faculty of Health Sciences
University of Cape Town

Professor S P Reddy
Director: National Health Promotion Research & Development Unit
Medical Research Council
P O Box 19070, Tygerberg, Parow Valley 7505, Cape Town

1. Background, Aims and Objectives

The Link Between Physical Activity, Morbidity and Mortality

In the first report on 'Physical Activity and Health' by the US Surgeon General in 1996, key findings highlighted that a) people of all ages, both male and female, gain health benefits from regular physical activity and; b) regular physical activity, preferably a daily regimen of at least 30–45 minutes of brisk walking, bicycling, or even working around the house, would reduce an individual's risk of premature mortality in general, and of developing coronary heart disease, hypertension, colon cancer, and diabetes (Centers for Disease Control and Prevention, 1996). This review of international research on physical activity and health was an important landmark in highlighting the link between physical activity, morbidity and mortality and hence, of importance in the prevention of chronic diseases.

Factors influencing participation in physical activity

Environmental, Socio-demographic and Psychosocial Determinants

A study by Gordon-Larsen, McMurray et al (2000) investigated the *environmental* and *socio-demographic* determinants of physical activity and inactivity patterns among subpopulations of nationally represented US adolescents (n=17 766). Environmental determinants in this study were defined as “modifiable factors in the physical environment that imposed a direct influence on the opportunity to engage in physical activity” (Gordon-Larsen et al., 2000) and included '*participation in school physical education programs*', '*use of the community recreation centre*' and the '*total reported incidents of serious crime in the neighbourhood*.' Their results showed that participation in daily school physical education program classes and use of a community recreation centre were associated with an increased likelihood of engaging in high moderate to vigorous physical activity, whereas a high neighbourhood serious crime level was associated with a decreased likelihood of engaging in high moderate to vigorous physical activity. Results for the socio-demographic determinants showed that '*maternal education*' was inversely associated with high inactivity patterns and high '*family income*' was associated with increased moderate to vigorous physical activity and decreased inactivity (Gordon-Larsen et al., 2000).

An observational study by Dollman and Lewis in 2005 on South Australian families, investigated the psychosocial determinants (socioeconomic position) of 10-15 year old children's (n=3300) physical activity. This study showed that among *high* socioeconomic position (SEP) children (as operationalised by the mother's level of education), perceived outcomes was a significant predictor of physical activity for both boys and girls, whereas among *lower* socioeconomic position children, perceived outcome was a predictor of only boys physical activity,

whilst parental support was the only significant predictor amongst girls (Dollman and Lewis, 2009). They concluded that parental support was a powerful limiting factor among low SEP girls and thus interventions focusing on supporting parents to provide support for their daughters to engage in physical activity was important.

In a two-stage cluster sample self-administered survey of high school learners (n=1041) and participation in physical activity in a Canadian school district, Allison, Dwyer et al. (1999) identified '*time constraints due to school work*', '*other interests*', and '*family activities*' as the major perceived barriers to participation in physical activity. Females showed consistently higher levels of perceived barriers to physical activity than males. The authors further identified perceived internal barriers and perceived external barriers to physical activity, where perceived internal barriers were predictive of physical activity in overall activity and outside of school activity and perceived external barriers were predictive of overall physical activity and school activity (Allison et al., 1999).

Social Support

It is well established that social support from family and friends has been consistently and positively related to regular physical activity (King et al., 2008, Centers for Disease Control and Prevention, 1996) and that the lack of social support is a perceived barrier to adolescents engagement in physical activity (King et al., 2008).

King and Tergerson et al (2008) conducted a survey examining the effect that social support has on adolescents' physical activity and their perceived barriers and benefits to exercising among a sample of adolescents in US high schools (n=535). Their findings showed that adolescents who received encouragement from parents to exercise and who had a friend who exercised, engaged in significantly more days of physical activity in the past 7 days prior to the survey than did their counterparts. Perceived benefits of physical activity differed significantly based on whether the respondent received parental encouragement and had a friend who exercised. They concluded that social support for physical activity from parents and friends significantly affected adolescents' perceptions of and engagement in physical activity, and recommended that parents should encourage their children to become physically active and partner with peers when exercising (King et al., 2008).

The South African National Youth Risk Behaviour Survey (YRBS 1)

The Youth Risk Behaviour Surveillance System (YRBSS) was initially developed in 1990 by the Centres for Disease Control (CDC) to monitor the prevalence of priority health risk behaviours that contributed significantly to the leading causes of death, disability, and social problems among youth and adults in the United States. These included behaviours contributing to unintentional injuries and

violence, tobacco use, alcohol and other drug use, sexual behaviours contributing to unintended pregnancy and sexually transmitted infections, unhealthy dietary behaviours and inadequate physical activity. Additionally, the general health status and the prevalence of obesity and asthma was also monitored (Centers for Disease Control and Prevention, 2009).

The YRBSS included a national school-based survey conducted by the CDC – the Youth Risk Behaviour Survey (YRBS), as well as state, territorial, tribal, and local surveys (Centers for Disease Control and Prevention, 2009). The YRBSS has been conducted every 2 years since 1991 to monitor trends in the prevalence of youth risk behaviours and to provide comparable national, state, territorial, tribal, and local data among subpopulations of youth.

Subsequently, the first National Youth Risk Behaviour Survey in South Africa (YRBS 1) was commissioned by the National Department of Health of South Africa and was conducted by the Health Promotion Research and Development Unit of the Medical Research Council, South Africa in 2002. This survey was the first nationally representative study of the prevalence of risky health behaviours, including physical activity and inactivity among high school learners in South Africa. This study was a cross sectional prevalence quantitative survey administered to 188 public schools across the 9 provinces of South Africa and involved 10 699 learners from grades 8-11. Learners responded to a self-administered questionnaire exploring clusters of behaviours including sexual, substance abuse, nutrition and diet, injury, hygiene and physical activity related behaviours (Reddy et al., 2003).

		PARTICIPATED IN SUFFICIENT VIGOROUS PHYSICAL ACTIVITY			PARTICIPATED IN SUFFICIENT MODERATE PHYSICAL ACTIVITY			PARTICIPATED IN INSUFFICIENT OR NO PHYSICAL ACTIVITY		
		MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
NATIONAL	n	4,776	5,495	10,271	4,797	5,511	10,308	4,764	5,414	10,100
	%	57.1	34.7	44.6	32.6	34.2	33.5	34.4	43.0	37.5
	LCL	54.6	31.7	42.3	31.0	32.3	32.2	32.3	41.0	36.0
	UCL	59.6	37.6	46.8	34.2	36.2	34.8	36.5	45.0	39.0
WESTERN CAPE	n	615	769	1,384	615	772	1,387	609	759	1,357
	%	56.5	28.5	40.0	32.7	31.6	32.1	35.2	49.1	41.7
	LCL	50.4	25.0	35.7	26.7	26.4	27.7	28.7	43.7	37.4
	UCL	62.5	31.9	44.2	38.7	36.8	36.4	41.6	54.6	45.9

LCL – lower confidence interval
UCL – upper confidence interval

Table 1: Results of the YRBS 1 physical activity questions - National and Western Cape Province prevalence of high school learners who participated in vigorous, moderate and insufficient/no physical activity by gender (Adapted from Reddy, Panday et al (2003)).

National results from the YRBS 1 showed that approximately 44.6% of learners participated in sufficient vigorous physical activity, 33.5% participated in sufficient moderate physical activity and 37.5% of all the learners did not participate in physical activity that was sufficient to gain any health benefit, or abstained from physical activity during the 7 days preceding the survey (table 1).

Significantly more females (43.0% [41.0-45.0]) than males (34.4% [32.3-36.5]) participated in insufficient or no physical activity, and the gender difference was significant within the black and coloured population groups. There was also no significant variation by grade. Reasons cited by learners for not participating in physical activity 7 days prior to the study included: '*generally unwilling to participate*' (25.9%), '*feeling ill*' (19.1%), '*feeling unsafe in their surroundings*' (7.0%), '*having no access to physical activity equipment*' (15.7%) and 32.3% did not have a reason for their inactivity (Amosun et al., 2007). Within the school setting, 29.0% of the learners did not have physical education (PE) classes at their school; 52.8% were engaged in vigorous physical activity during physical education (PE) periods, while 7.8% were engaged in life skills education or other class discussions during PE periods (Amosun et al., 2007).

As part of the process to conduct YRBS 2, the overall **aims** of this study are:

- A. To determine the prevalence of self-reported physical activity behaviours among adolescents in Grades 8-11 in Western Cape public schools from the YRBS 2.
- B. To compare current physical activity behaviour trends and to determine if there is a statistically significant difference in these behaviours with the YRBS 1.
- C. To identify the characteristics of the participants grouped as being physically inactive.

The **objectives** of the study are:

- A. To determine the prevalence of the following self-reported physical activity behaviours in the YRBS 2.
 - a. Past 7-day frequency of participation in physical activity for at least 20 minutes
 - b. Reason for 7-day non participation in physical activity for at least 20 minutes
 - c. Past 7-day frequency of participation in physical activity for at least 30 minutes
 - d. Daily time spent watching television or playing video games
 - e. Number of days per week of physical education classes and/or sport on the school timetable
 - f. Main activity during physical education classes or sport at school

- B. To determine if there is a statistically significant difference in the above behaviours between the YRBS 2 and YRBS 1
- C. To identify the socio-demographic characteristics of physically inactive.

2. Methodology

2.1. Study Design

A cross sectional prevalence school-based quantitative survey design will be used.

2.2. Study Area

The YRBS 2 will be conducted in all 9 provinces in South Africa. This study will focus on the results from public secondary schools sampled in the Western Cape Province only.

2.3. Study Setting

Secondary schools in the public sector that contain Grades 8-11.

2.4. Study Population

Learners currently in Grades 8-11 will be selected to form the study population. Grade 12 learners will not be selected due to potential conflicts with demanding final examination preparation schedules. Grades will be selected over age ranges due to practicalities as there existed a wide range of ages in each grade.

2.5. Sampling (Adapted from Reddy, Panday et al (2003))

The sampling frame will consist of learner enrolment numbers for each public school in the country as provided by the School Information Services Directorate, National Department of Education. The sampling strategy will consist of a stratified, two-stage cluster sample design to ensure the collection of nationally and provincially representative data from a population arranged into school and class-level clusters.

At the first stage of sampling, schools will be the primary sampling units (PSUs) and will be selected with a probability proportional to school learner enrolment size in grades 8 to 11. At the second stage of sampling, classes within each participating school will be selected systematically with equal probability sampling (with a random start). All learners in the selected classes will be eligible to participate. It was determined that 1200 learners in each province, including the Western Cape, will be selected, and it is assumed that each class would have approximately 40 learners. In

order to achieve the desired sample size, 207 schools will be selected nationally in the first stage of sampling, or 23 in each province, including the Western Cape, and on average 2 classes per school will be selected in the second stage.

2.5.1. Sample Size Calculation

The National prevalence of moderate physical activity from the YRBS 1 was 33.5% (Reddy et al., 2003). Recent studies have highlighted an increase in childhood obesity in South Africa (Kruger et al, 2006) and it is thought that a decrease in physical activity among urbanised adolescents may contribute towards this.

Using a one-sample comparison of proportion, with a hypothesized null value of 33.5%, the postulated alternative proportion of 28%, the alpha value of 0.05 (2-tailed) and a power of 0.9, the sample size was calculated to be 745.

2.6. Data Collection

Field researchers will be employed to assist with data collection in the Western Cape schools. Senior MRC Health Promotion researcher scientists will be involved in selection and training the field researchers on questionnaire administration. Questionnaires will then be administered by the trained field researchers at each of the selected schools in the Western Cape over a period of 2 months. Digital bar coded answer sheets will be provided to each learner to be answered with an HB lead pencil in a specified manner. Learners will be briefed by the field researchers on how to fill in the answer sheets correctly, so as to be accurately scanned by the optical scanning machine. The questionnaires from each school will be gathered at a common point by the Western Cape provincial co-ordinator (a Dept of Health official employed within the Health Promotion sub-departments). The questionnaires will then be sent to the Cape Town MRC Health Promotion Unit for sorting and data capture using an optical scanner and computer software. Answer sheets will be batch scanned by school. Data output files will be converted to SPSS compatible files and further analysed within STATA v10 statistical software.

2.7. Data Analysis

Descriptive statistical analysis will be done on the YRBS 2 physical activity behaviours.

Comparative analysis using the Student's t-test will be done on the YRBS 1 and YRBS 2 questions on physical activity to determine if there is any significant difference between the 2 data sets.

The Odds Ratio will be determined between the highest and lowest category of activity to the individual, psychosocial, environmental and other health risk behaviour determinants.

2.8. Ethical Considerations

Study Consent

Ethical consent was previously obtained from the South African Medical Association (SAMA) for the National study and permission will be obtained from the National Department of Education and individual school principals.

Participant Consent

Participation in the study is voluntary, anonymous and confidential with learners free to withdraw from the study at any stage. Participant information sheets and consent forms will be sent out to the schools 2 weeks prior to the administration of the questionnaire. They will then be handed out to the learners in the selected classes to be given to their parents to be read, signed and to be brought back to school to be collected on the day of questionnaire administration. Those learners over the age of 18 will be allowed to sign the consent forms. Questionnaires will be administered only to those that have signed consent forms agreeing to participate.

Dissemination

Findings of the survey will be written-up and submitted to peer-reviewed journals; presentations made and reports written to the Departments of Health and Education and other relevant stakeholders.

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PART B: Structured Literature Review

Physical activity behaviours in school-going adolescents in the Western Cape Province, South Africa

Word Count=±2700

1. Search Strategy

A PubMed (<http://www.ncbi.nlm.nih.gov/pubmed>) and a manual search of reference lists from relevant articles from 1980 to the present using MeSH headings and the search terms 'physical activity', 'adolescents' 'meta-analysis', 'systematic review' and 'randomised controlled trial' was conducted. A general Google scholar (<http://scholar.google.com>) search for local and international reports eg WHO, MRC and HST not cited on medical databases was also conducted.

2. Quality and relevance criteria of literature selected

Emphasis was placed on more recent studies and on meta-analyses, systematic reviews, original randomised controlled trials and cohort studies due to their strength of evidence. Research reports were also considered, as these contain local research findings that may not be published in peer reviewed journals.

3. Summary and Interpretation

Background and Introduction

South Africa: A country in transition

South Africa is currently undergoing an epidemiological transition as a consequence of rapid socioeconomic development and urbanisation (Steyn et al., 1997). This epidemiological or ‘risk’ transition (World Health Organisation, 2009) reflects the shift in disease prevalence towards non-communicable diseases (NCDs) such as cardiovascular diseases, diabetes and cancer. A major risk factor contributing towards these diseases is obesity, largely due to poor diet and physical inactivity. Adolescent obesity in South Africa in the past decade has been shown to be on an upward trend (Reddy et al., 2008, Kimani-Murage et al., 2010) and thus, preventing these risk factors in adolescence will help prevent the onset of NCDs in adulthood.

The link between physical activity, morbidity and mortality

The health benefits of physical activity were first highlighted globally in the report ‘*Physical Activity and Health*’ by the US Surgeon General in 1996. Key findings emphasised that, a) people of all ages, both male and female, gain health benefits from regular physical activity and; b) regular physical activity, preferably a daily regimen of at least 30–45 minutes of brisk walking, bicycling, or even working around the house, would reduce an individual’s risk of premature mortality and developing NCDs (Centers for Disease Control and Prevention, 1996). This report reviewing international research on physical activity and health was an important landmark in highlighting the link between physical activity, morbidity and mortality and hence its importance in the prevention of NCDs.

In relation to adolescent health and physical activity, Walter et al (1987) described 3 year follow-up results from one of the first randomised control trials investigating the primary prevention of cardiovascular disease in children, and showed that an elevated body mass index (BMI) put children and adolescents at a higher risk for cardiovascular disease as adults. They further proved that physical activity, along with diet, was important in maintaining a healthy BMI range. More recent large prospective cohort studies have confirmed this association (Baker et al., 2007, Bjørge et al., 2008).

It is well established that a 'threshold' of intensity, frequency and duration of physical activity must be reached and maintained in order to produce positive health effects (Shephard, 1997, Zahner et al., 2006). A positive linear association between the duration of physical activity and positive health effects has been proven, with a longer duration associated with increased physical health (Pate et al., 1994, Shephard, 1997) .

More recent World Health Organisation (WHO) guidelines suggest that children should be involved in ≥ 60 minutes of active play at least five days per week (World Health Organisation, 2004). These recommendations also suggest that adolescents should engage in ≥ 3 sessions per week of moderate to vigorous activities lasting ≥ 20 minutes at a time. Examples of vigorous activities include brisk walking, jogging, stair climbing, soccer and swimming laps, whilst moderate intensity activities include fast walking, slow bicycling or sweeping floors.

Other studies have suggested that the best primary strategy for improving the long-term health of children and adolescents through exercise is to create a lifestyle pattern of regular physical activity that will be carried over to the adult years (Freedson and Rowland, 1992). This implies that it is of primary importance to identify barriers to sustained physical activity levels of children and adolescents.

The South African National Youth Risk Behaviour Surveys

The Youth Risk Behaviour Surveillance System (YRBSS) was initially developed in 1990 by the US Centres for Disease Control (CDC) to monitor the prevalence of priority health risk behaviours that contributed significantly to the leading causes of death, disability, and social problems among youth and adults in the US. These included behaviours such as inadequate physical activity and others such as tobacco, alcohol and other drug use, risky sexual behaviour, unhealthy dietary behaviours and unintentional injuries and violence. Additionally, the general health status and the prevalence of obesity was also monitored (CDC and National Center for Chronic Disease Prevention and Health Promotion, 2009).

The YRBSS also included a national school-based survey – the Youth Risk Behaviour Survey (YRBS) conducted every 2 years since 1991 to monitor trends in the prevalence of youth risk behaviours and to provide comparable national, state, territorial, tribal, and local data among subpopulations of youth (CDC and National Center for Chronic Disease Prevention and Health Promotion, 2008).

Subsequently, the first National YRBS in South Africa (YRBS 1) was commissioned by the National Department of Health and was conducted by the Health Promotion Research and Development Unit of the Medical Research Council of South Africa in 2002. This survey was the first nationally representative study of the prevalence of risky health behaviours, including physical activity among high school learners in South Africa (Reddy et al., 2003). This study was a cross sectional prevalence quantitative survey administered to 188 public schools across the 9 provinces of South Africa and involved 10,699 learners from grades 8-11. Learners responded to a self-administered questionnaire exploring clusters of behaviours including physical activity, sexual, substance abuse, nutrition and diet, injury and hygiene related behaviours (Reddy et al., 2003).

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	MALE FEMALE TOT				MALE FEMALE TOT			MALE FEMALE	TOTAL	
NATIONAL	n	4,776	5,495	10,271	4,797	5,511	10,308	4,764	5,414	10,100
	%	57.1	34.7	44.6	32.6	34.2	33.5	34.4	43.0	37.5
	LCL	54.6	31.7	42.3	31.0	32.3	32.2	32.3	41.0	36.0
	UCL	59.6	37.6	46.8	34.2	36.2	34.8	36.5	45.0	39.0
WESTERN CAPE	n	615	769	1,384	615	772	1,387	609	759	1,357
	%	56.5	28.5	40.0	32.7	31.6	32.1	35.2	49.1	41.7
	LCL	50.4	25.0	35.7	26.7	26.4	27.7	28.7	43.7	37.4
	UCL	62.5	31.9	44.2	38.7	36.8	36.4	41.6	54.6	45.9

LCL – lower confidence interval
UCL – upper confidence interval

Table 1: Results of the YRBS 1 physical activity behaviours - National and Western Cape Province prevalence of high school learners who participated in vigorous, moderate and insufficient/no physical activity by gender (Adapted from Reddy et al (2003)).

National results from the YRBS 1 showed that approximately 44.6% of learners participated in sufficient vigorous physical activity, 33.5% participated in sufficient moderate physical activity and 37.5% of all the learners did not participate in physical activity that was sufficient to gain any health benefit, or abstained from physical activity during the 7 days preceding the survey (table 1). Significantly more females (43.0% [41.0-45.0]) than males (34.4% [32.3-36.5]) participated in insufficient or no physical activity and there was also no

significant variation by grade. These proportions were similar for learners from the Western Cape.

Reasons cited by national learners for not participating in physical activity 7 days prior to the study included: '*generally unwilling to participate*' (25.9%), '*feeling ill*' (19.1%), '*feeling unsafe in their surroundings*' (7.0%), '*having no access to physical activity equipment*' (15.7%), and 32.3% did not have a reason for their inactivity (Amosun et al., 2007). Within the school setting, 29.0% of the learners did not have physical education (PE) classes at their school; 52.8% were engaged in vigorous physical activity during physical education (PE) periods, while 7.8% were engaged in other class activities during PE periods (Amosun et al., 2007).

The second YRBS was conducted in late 2008 and the current study analysed a subset of the data collected from the Western Cape province.

Factors Influencing Adolescent Participation in Physical Activity

(a) Psychosocial Determinants

Prior studies have suggested that the relationship between increased physical activity and healthy psychological well-being may serve as a protective factor against health risk behaviours (eg suicide) and contribute to health promoting behaviours (Brosnahan et al., 2004). Moreover, those who engage in high levels of physical activity may also be exposed to positive social influences that promote healthy behaviours (Petosa et al., 2005, Nelson and Gordon-Larsen, 2006). Thus, it may be inferred that those who are exposed to negative or neutral social influences are likely to be more physically inactive.

With respect to suicide risk and physical activity, Taliaferri et al (2008) analysed data from the 2005 US YRBS (n=13,857) to compare the odds ratios of hopelessness and suicidality in students who were active compared to those who were inactive. Their findings showed that frequent, vigorous activity reduced the risk of feelings of hopelessness and suicidality among male adolescents (6-7 times/week; OR=0.84; 95%CI: 0.68-1.03), whilst less frequent physical activity increased the risk of among younger females (1-2 times/week; OR=1.22; 95%CI: 1.06-1.42). The authors concluded that participation in sport protected against hopelessness and suicidality for both males and females overall (Taliaferro et al., 2008). This study strongly suggests that feelings of hopelessness and suicidality are associated with physical inactivity.

Allison et al (1999) explored the psychosocial determinants of physical inactivity in a two-stage cluster sample self-administered survey of high school learners (n=1,041) and participation in physical activity in a Canadian school district. They identified '*time constraints due to school work*', '*other interests*', and '*family activities*' as the major perceived barriers to participation in physical activity. Females showed consistently higher levels of perceived barriers to physical activity than males. The authors further identified perceived internal barriers (eg. personal perception of weight) and perceived external barriers to physical activity. Their findings showed that perceived internal barriers were predictive of physical activity in overall activity and outside of school activity and perceived external barriers were predictive of overall physical activity and school activity (Allison et al., 1999).

(b) Socioeconomic Determinants

Walking as a means of active commuting to school is one of the most common types of physical activity among school children in rural parts of South Africa. In a cross sectional study of 10 – 15 year old males in both rural and urban parts of the North-West province of South Africa, results showed that measures of obesity increased with a decrease in physical activity and that rural adolescents were less obese than the peri-urban and urban adolescents strongly suggesting that rural adolescents are more physically active than urban adolescents (Underhay et al., 2002).

A recent systematic review of 62 studies exploring the relationship between physical activity and socioeconomic status (SES) in adolescents, aged 13-18 years supported the hypothesis that there is an association between physical activity and socioeconomic status in adolescents in most of the studies, with higher SES adolescents more physically active than those with a lower SES (Stalsberg and Pedersen, 2010). However, 42% of the studies showed no or an opposite relationship with inconsistent use of measures for both variables being the main cause for these findings. The authors concluded that there was no single explanation for the possible difference in physical activity between higher and lower SES groups (Stalsberg and Pedersen, 2010).

An observational study (n=3,300) by Dollman and Lewis (2009) on South Australian families, investigated the role of SES on 10-15 year old children's physical activity. They showed that among high SES children (as operationalised by the mother's level of education), perceived outcomes was a significant predictor of physical activity for both boys and girls whereas among lower SES children, perceived outcome was a predictor of only boys physical activity, whilst parental support was the only significant predictor amongst girls (Dollman and Lewis, 2009). They concluded that parental support was a powerful limiting factor among low SES girls and thus interventions focusing on supporting parents to provide support for their daughters to engage in physical activity was important.

Results from a longitudinal study (n=17766) by Gordon-Larsen et al (2000) among subpopulations of nationally represented US adolescents of the socio-demographic determinants showed that high '*family income*' was associated with increased moderate to vigorous physical activity and decreased inactivity and that '*maternal education*' was inversely associated with high inactivity patterns.

(c) Environmental Determinants

The longitudinal study by Gordon-Larsen et al (2000) also investigated the environmental determinants of physical activity and inactivity patterns. Environmental determinants were defined as "modifiable factors in the physical environment that imposed a direct influence on the opportunity to engage in physical activity" and included '*participation in school physical education programs*', '*use of the community recreation centre*' and the '*total reported incidents of serious crime in the neighbourhood.*' Their results showed that participation in daily school physical education program classes and use of a community recreation centre were associated with an increased likelihood of engaging in high moderate to vigorous physical activity whereas a high neighbourhood serious crime level was associated with a decreased likelihood of engaging in high moderate to vigorous physical activity.

(d) Other Health Risk behaviours

Studies have shown that the best predictors for youth health behavior have been found to be the factors related to earlier health behaviour (Yang et al., 1999, Gillander Gadin and Hammarstrom, 2002) and more specifically, that the best predictor for physical activity is the previous physical activity level (Kelder et al., 1994, Mulder et al., 1998, Garcia et al., 1998).

Health behaviours that are usually established during the adolescent years share common determinants and are related to similar health behavioural patterns in adulthood, and are then most beneficial to health outcomes when practiced throughout the life of individuals. Thus an understanding of the relationships among multiple health behaviours is important in understanding health outcomes, more so in adolescents (Arthur et al., 2002, Paavola et al., 2004). It is well established in the literature that health behaviours tend to cluster together among adolescents and adults (Paavola et al., 2004) as many of the risk behaviours are interrelated eg. violence and risky sexual behaviours, and tend to accumulate. This is based on the problem-behaviour theory which states that a psychosocial proneness to particular risk behaviour consists of a coherent pattern of individual/personality, environmental and behavioural attributes (Jessor and Jessor, 1977).

Smoking has been previously reported to correlate with physical inactivity (Raitakari et al., 1995, Aarø et al., 1995). Yang et al (1999) found that non-smoking predicted physical activity in a 12-year follow-up study (the Cardiovascular Risk in Young Finns study, n=2411 adolescents). Another 13 year longitudinal study of Finnish school-going adolescents completed in 1993 (the North Karelia Youth Project study, n=903 adolescents) showed smoking to be negatively correlated with physical activity (Paavola et al., 2004). The authors concluded that smoking played a central role among health behaviours and could be used as a predictor of future physical activity behaviours.

A recent US high school-based survey of grade 11 and 12 adolescents (n=822) by Delisle et al (2010) exploring the relationship between frequency and intensity of physical activity and other health behaviours of adolescents showed that (a) the high vigorous activity group showed lower frequency of cigarette smoking and quantity of cigarette smoking, (b) adolescents engaging in high frequencies of vigorous activity used marijuana less frequently ($p = 0.05$) and reported less frequent heavy use of marijuana ($p = 0.03$). Their findings also suggested that vigorous physical activity is a better predictor of other health behaviours in adolescents than

moderate physical activity. The authors concluded that high frequency levels of moderate and physical activity were associated with reduced substance use and other health promoting behaviours (Delisle et al., 2010). Alcohol use was not shown previously to be associated with physical inactivity in adolescents (Paavola et al., 2004, Delisle et al., 2010).

4. Research Gaps

There have not been many studies, and more so trend data, on physical activity behaviours and the characteristics of physically inactive adolescents in the Western Cape and South Africa. This study will highlight the same physical activity behaviours in a similar age group using the same study design as the previous study (YRBS 1) conducted 6 years previously.

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University of Cape Town

**Physical activity behaviours in school-going adolescents in the Western Cape Province,
South Africa**

Naidoo N*, Amosun, SLand Reddy P***

*National Health Promotion Research & Development Unit
Medical Research Council
P O Box 19070, Tygerberg, Parow Valley 7505, Cape Town

**Department of Health & Rehabilitation Sciences
Faculty of Health Sciences
University of Cape Town

Corresponding author:

Dr N Naidoo; tel: +27 21 938 044; fax: +27 866578710; email: Nasheen.Naidoo@mrc.ac.za

Key Words: physical activity, behaviours, adolescents, South Africa, YRBS, Youth Risk Behaviour Survey, Western Cape

Word Count: ±4200

Note to reader: Tables have inserted within the text, rather than in the Appendix, for readability

ABSTRACT (±300 words)

Objectives. (a) To determine the prevalence of self-reported physical activity behaviours in the 2008 Youth Risk Behavior Survey (YRBS 2); (b) To determine if there were statistically significant differences in these behaviours with the 2002 YRBS (YRBS 1); (c) To identify characteristics of physically inactive participants

Design. A cross sectional prevalence school-based quantitative survey

Setting. 22 public secondary schools in the Western Cape province of South Africa

Subjects. 1134 Grades 8-11 secondary school learners

Results. Significantly younger learners (15.4 years vs 16.2 years; $p<0.001$) participated. From the comparative analysis between YRBS 2 and YRBS 1: (a) more learners did not participate in vigorous (37% vs 35%; $p=0.32$) and moderate (29% vs 23.3%; $p=0.001$) activities in the previous 7 days, (b) fewer learners did not have access to equipment/sporting grounds/gyms (3.8% vs 6.7%; $p=0.001$), (c) more learners spent 2-4 hours/day watching TV/playing video games and (d) fewer learners did not have PE classes (28.6% vs 47.0%; $p<0.001$).

A stratified analysis of individual, psychosocial, socioeconomic, environmental and other health risk behaviour variables by physically inactive ($n=432$) and physically active ($n=764$) groups revealed the statistically significant characteristics of the physically inactive group to include: being female, feeling sad/hopeless and having consulted a professional, perceiving themselves as overweight and admitting to not doing anything about it, living in an urban/periurban area, having no PE classes at school, watching TV/playing computer games $<1\text{hr/day}$ and having smoked cigarettes for ≥ 1 day in a month.

Conclusion. Fewer adolescents in Grades 8-11 in the selected public schools in the Western Cape in 2008 participated in vigorous and moderate physical activity within the previous 7 days than adolescents in 2002. Environmental determinants such as school PE classes and TV watching/video game playing; and socioeconomic status determinants such as living in an urban area, appeared to have the strongest influence on physical inactivity and could thus be potential target areas for future interventions to improve physical activity behaviours of this group.

Background and Introduction

South Africa: A country in transition

South Africa is currently undergoing an epidemiological transition as a consequence of rapid socioeconomic development and urbanisation¹. This epidemiological or ‘risk’ transition reflects the shift in disease prevalence towards non-communicable diseases (NCDs) such as cardiovascular diseases, diabetes and cancer. A major risk factor contributing towards these diseases is obesity, largely due to poor diet and physical inactivity. Adolescent obesity in South Africa in the past decade has been shown to be on an upward trend^{2,3}. Thus, preventing this risk factor in adolescents with health promoting behaviours such as physical activity will help prevent the onset of NCDs in adulthood.

Physical activity requirements for healthy outcomes

It is well established that a ‘threshold’ of intensity, frequency and duration of physical activity must be reached and maintained in order to produce positive health effects. A positive linear association between the duration of physical activity and positive health effects has been proven, with a longer duration associated with increased physical health⁴.

Recent World Health Organisation (WHO) guidelines suggest that children should be involved in ≥ 60 minutes of active play for at least 5 days per week⁵. These recommendations also suggest that adolescents should engage in ≥ 3 sessions per week of moderate to vigorous activities lasting ≥ 20 minutes at a time. Examples of vigorous activities include brisk walking, jogging, stair climbing, soccer and swimming laps, whilst moderate intensity activities include fast walking, slow bicycling or sweeping floors.

The South African National Youth Risk Behaviour Surveys

The first National Youth Risk Behaviour Survey in South Africa (YRBS 1) was a cross sectional prevalence quantitative survey administered to 188 public schools across the 9 provinces of South Africa and involved 10,699 learners from Grades 8-11. Learners responded to a self-administered questionnaire exploring clusters of behaviours including physical activity, sexual, substance abuse, nutrition and diet, injury and hygiene related behaviours.

Western Cape province results from the YRBS 1 showed that approximately 40% of learners participated in sufficient vigorous physical activity, 32.1% participated in sufficient moderate physical activity and 41.7% of all the learners did not participate in physical activity that was sufficient to gain any health benefit, or abstained from physical activity during the 7 days preceding the survey⁶.

The second YRBS was conducted in late 2008 and our current study analysed a subset of the data collected from the Western Cape province.

Factors Influencing Adolescent Participation in Physical Activity

Psychosocial Determinants

Prior studies have suggested that the relationship between increased physical activity and healthy psychological well-being may serve as a protective factor against health risk behaviours (e.g. suicide) and contribute to health promoting behaviours⁶. With respect to suicide risk and physical activity, Taliaferri *et al*⁷ analysed data from the 2005 US YRBS (n=13,857) to compare the odds ratios of feelings of hopelessness and suicidality in students who were active compared to those who were inactive. Their findings showed that frequent, vigorous activity reduced the risk of feelings of hopelessness and suicidality among male adolescents (6-7 times/week; OR=0.84; 95%CI: 0.68-1.03), whilst less frequent physical activity increased the risk among younger females (1-2 times/week; OR=1.22; 95%CI: 1.06-1.42).

Socioeconomic Determinants

A recent systematic review of 62 studies exploring the relationship between physical activity and socioeconomic status (SES) in adolescents, aged 13-18 years, supported the hypothesis of an association between physical activity and socioeconomic status in adolescents in most of the studies, with higher SES adolescents more physically active than lower SES adolescents⁸. However, 42% of these studies showed no relationship or an opposite relationship between SES and physical activity, with inconsistent use of measures for both variables cited as the main cause for these findings. The authors concluded that there was no single explanation for the possible difference in physical activity between higher and lower SES groups⁸.

Walking as a means of active commuting to school is one of the most common types of physical activity among school children in rural parts of South Africa. In a cross sectional study of 10 – 15 year old males in both rural and urban parts of the North-West province of South Africa, results showed that measures of obesity increased with a decrease in physical activity and that rural adolescents were less obese than peri-urban and urban adolescents, strongly suggesting that rural adolescents are more physically active than urban adolescents⁹.

Environmental Determinants

In a longitudinal study (n=17,766) by Gordon-Larsen *et al*¹⁰ environmental determinants of physical activity were defined as “modifiable factors in the physical environment that imposed a direct influence on the opportunity to engage in physical activity” and included ‘*participation in school physical education programs*’, ‘*use of the community recreation centre*’ and the ‘*total reported incidents of serious crime in the neighbourhood*.’ Their results showed that participation in daily school physical education program classes and use of a community recreation centre were associated with an increased likelihood of engaging in high moderate to vigorous physical activity, whereas a high neighbourhood serious crime level was associated with a decreased likelihood of engaging in high moderate to vigorous physical activity.

Other health risk behaviours

It is well established in the literature that health risk behaviours tend to cluster together among adolescents¹² as many of the risk behaviours are interrelated eg. violence and risky sexual behaviours. This is based on the problem-behaviour theory which states that a psychosocial proneness to particular risk behaviour consists of a coherent pattern of individual/personality, environmental and behavioural attributes.

Smoking has been previously reported to correlate with physical inactivity. Yang *et al*¹¹ found that not smoking predicted physical activity in a 12-year follow-up study (the Cardiovascular Risk in Young Finns study, n=2,411 adolescents). Another 13 year longitudinal study of Finnish school-going adolescents completed in 1993 (the North Karelia Youth Project study, n=903 adolescents) showed smoking to be negatively correlated with physical activity¹². A recent US high school-based survey of grade 11 and 12 adolescents (n=822) by Delisle *et al*¹³

exploring the relationship between frequency and intensity of physical activity and other health behaviours of adolescents showed that adolescents engaging in high frequencies of vigorous activity used marijuana less frequently ($p = 0.05$) and reported less frequent heavy use of marijuana ($p = 0.03$). Alcohol use was not shown previously to be associated with physical inactivity in adolescents^{12,13}.

Research Gaps

There have not been many studies, and more so trend data, on physical activity behaviours and the characteristics of physically inactive adolescents in the Western Cape and across South Africa. This study will highlight the same physical activity behaviours in a similar age group using the same study design as the previous study (YRBS 1) conducted 6 years previously.

Thus, the aims of this study were (a) to determine the prevalence of self-reported physical activity behaviours among adolescents from the YRBS 2 in Grades 8-11 in Western Cape public schools; (b) to determine if there is a statistically significant difference in these behaviours with the YRBS 1 and (c) to identify the characteristics of physically inactive participants in the YRBS 2.

Methods

Study Design, Study Area and Study Setting

A cross sectional national prevalence school-based quantitative survey study design was used. The study area of the YRBS 2 consisted of and was conducted in all 9 provinces in South Africa. Our current study focused on the results from schools sampled in the Western Cape Province only.

The study setting was secondary schools in the public sector with Grade 8-11 classes. Learners in Grades 8-11 at the time of data collection were selected to form the study population. Grade 12 learners were not selected due to potential conflicts with demanding final examination preparation schedules. Grades were selected over age ranges due to the existence of a wide range of ages in each grade previously⁶.

Sampling Method

The sampling methods used in this study were that as previously employed in the YRBS 1 by Reddy, Panday et al (2003). The sampling frame consisted of learner enrolment numbers for each public school in the country as provided by the School Information Services Directorate, National Department of Education. The sampling strategy consisted of a stratified, two-stage cluster sample design to ensure the collection of nationally and provincially representative data from a population arranged into school and class-level clusters.

At the first stage of sampling, schools were the primary sampling units (PSUs) and were selected with a probability proportional to school learner enrolment size in grades 8 to 11. At the second stage of sampling, classes within each participating school were selected systematically with equal probability sampling (with a random start). All learners in the selected classes were eligible to participate. It was calculated that 1200 learners in each province, including the Western Cape, were to be selected, and it was assumed that each class would have approximately 40 learners. In order to achieve the desired sample size, 207 schools were selected nationally in the first stage of sampling, or 23 in each province, including the Western Cape, and on average 2 classes per school were selected in the second stage. Approximately 13,379 learners were sampled and 10,270 participated ie. an overall response rate of 76.7%.

Sample Size Calculation

The National prevalence of moderate physical activity from the YRBS 1 was 33.5%⁶. Several recent studies have highlighted an increase in childhood obesity in South Africa^{2, 14} and it was thought that a decrease in physical activity among urbanised adolescents may be contributing towards this.

Using a one-sample comparison of proportion, with a hypothesized null value of 33.5%, the postulated alternative proportion of 28%, the alpha value of 0.05 (2-tailed) and a power of 0.9, the sample size was calculated to be 745.

Research Instrument (Appendix 1)

The South African YRBS 1 questionnaire was initially based on the CDC YRBS survey instrument and adapted to a South African context. The questionnaire was designed to measure

behaviours that place adolescents at health risk namely intentional and unintentional injury, substance use, sexual behaviour, nutrition and weight perception, physical activity and hygiene. The questionnaire included only closed-ended questions, without 'skip' pattern type questions and only 1 multiple response question and consisted of 135 questions which took learners approximately 1 hour to complete.

The questionnaire was initially designed in English, translated and then back translated into the remaining official 10 languages and administered in the first language of the learners of each specific school.

The YRBS 1 was first piloted on Grade 8 learners in 5 provinces prior to the main study. This was to ensure face and construct validity of the questionnaire and to test the logistics of data collection. Hence, a pilot study for the YRBS 2 was not conducted.

Data Collection

Community research assistants (CRAs) were employed to assist with data collection in the Western Cape schools. Senior MRC Health Promotion research scientists were involved in selection and training of the CRAs on questionnaire administration. Questionnaires were then administered by the trained CRAs at each of the selected schools in the Western Cape over a period of 2 months. Digital bar coded answer sheets were provided to each learner to be answered with an HB lead pencil in a specified manner. Learners were briefed by the CRAs on how to fill in the answer sheets correctly, so as to be accurately scanned by the optical scanning machine. The questionnaires from each school were gathered at a common point by the Western Cape provincial co-ordinator (a Dept. of Health official employed within the Health Promotion sub-departments). The questionnaires were then sent to the Cape Town MRC Health Promotion Unit for sorting and data capture using an optical scanner and computer software (NCS Pearson Opscan 4u). Answer sheets were batch scanned by school. Data output files were converted to MS-Excel compatible files. Data collection protocols were identical to that of the YRBS 1.

Ethical Considerations

Study Consent

Ethical consent for our study was obtained from the Research Ethics Committee of the Health Sciences Faculty, University of Cape Town (REC REF: 029/2010). Further permission was

obtained from the National Department of Education and separate information sheets and consent to participation forms were issued to individual school principals, parents and students.

Participant Consent

Participation in the study was voluntary, anonymous and confidential with learners free to withdraw from the study at any stage without explanation or discrimination. Participant information sheets and consent forms were sent out to the schools 2 weeks prior to the administration of the questionnaire. They were then handed out to the learners in the selected classes to be given to their parents to be read, signed and be brought back to school to be collected on the day of questionnaire administration. Those learners over the age of 18 were allowed to sign the consent forms. Questionnaires were administered only to those that have signed consent forms agreeing to participate. It was further explained that the results would be stored securely with access only to the senior research staff.

Data Analysis

Data analysis was conducted with the STATA v10 statistical software package. The mean age and the proportions for gender, race and grade were calculated for the Western Cape YRBS 2 and YRBS 1. Missing values and all participants who did not enter their gender were removed from the datasets.

A 2 sample Student's T-test was performed to determine if there was a significant difference in the mean age between the 2 samples. Two sample tests of proportion were performed to determine if there was a significant difference between the gender, race and grade of the learners in the 2 samples.

The questions related to physical activity from the YRBS 2 and YRBS 1 questionnaires were selected for analysis (Table 2). The proportion for each response was calculated and a comparison between the YRBS 2 and YRBS 1 proportions of the responses was calculated using a 2 sample test of proportions. Missing values were removed in the calculations.

The YRBS 2 learners were stratified into those who participated and those who did not participate in physical activity in the previous 7 days. Physical inactivity was defined as not participating in moderate or vigorous physical activity in the previous 7 days.

Selected variables (n= 37) hypothesized to be potential barriers to physical activity based on previous literature were chosen from the YRBS 2 questionnaire. Study outcomes were grouped into five domains for further analysis: individual, psychosocial, socioeconomic, environmental and other health risk behavior determinants. Responses to these variables were selected for analysis based on relevance to the study hypothesis and on literature review findings.

The proportions of the responses were calculated and the test of proportions was used to compare the responses between the physically inactive and the physically active group. The odds ratio and 95%CI were calculated.

Results

A total of 1134 students were surveyed across 23 schools in the Western Cape. Comparing the YRBS 2 to the YRBS 1 sample (table 1), there were significantly:

- a) younger learners (15.4 years vs 16.2 years; $p<0.001$)
- b) fewer Black (28% vs 32%; $p<0.03$) and White (4.1% vs 9.6%; $p<0.001$) learners
- c) more Coloured (66.3% vs 57.1%; $p<0.001$) and Other race (1.0% vs 0.4%; $p<0.001$) learners
- d) fewer grade 9 (18.2% vs 33.7%; $p<0.001$) and more grade 10 (35.2% vs 18.5%; $p<0.001$) learners

Table 1: Demographic characteristics of the Western Cape YRBS 2 (2008) and YRBS 1 (2002) samples and a comparative analysis

	YRBS 2 (2008) (n=1134)*	YRBS 1 (2002) (n=1379)**	p-value [†]
	n (%)	n (%)	
Male	492 (43.4)	614 (44.5)	0.58
Female	642 (56.6)	765 (55.5)	0.58
Age (y) (mean (SD))	15.4 (1.47)	16.2 (1.94)	<0.001
Race			
Black	318 (28.0)	443 (32.1)	0.03
Coloured	752 (66.3)	787 (57.1)	<0.001
Indian	7 (0.6)	11 (0.8)	0.55
White	46 (4.1)	132 (9.6)	<0.001
Other	11 (1.0)	6 (0.4)	<0.001
Grade			
8	323 (28.5)	381 (27.6)	0.62
9	206 (18.2)	465 (33.7)	<0.001
10	400 (35.3)	255 (18.5)	<0.001
11	205 (18.1)	279 (20.2)	0.18

Comparing the responses from the physical activity behaviour questions between learners in YRBS 2 and YRBS 1, the following results were noted (table 2).

1. Vigorous activity (past 7 days)

More learners in 2008 did not take part in vigorous physical activity for at least 20 minutes in the previous 7 days compared to learners in 2002 (37% vs 35%; $p=0.32$). Of those that participated in vigorous physical activity fewer learners in 2008 participated in vigorous activity for 4-5 days/week than in 2002 (4days (6.2% vs 8.2%; $p=0.05$); 5days (3.0% vs 6.9%; $p<0.001$)). Fewer learners in 2008 participated in vigorous activity everyday (11.6% vs 12.5%; $p=0.49$) although this result was not statistically significant.

2. Moderate activity (past 7 days)

More learners in 2008 did not take part in moderate physical activity for at least 30 minutes in the past 7 days (29% vs 23.3%; $p=0.001$). Of those that participated in moderate physical activity, less were physically active everyday than in 2002 (15.3% vs 20%); $p=0.002$).

3. Main reasons for not participating in physical activity

The main reasons for not participating in physical activity in 2008 learners were '*not wanting to take part in physical activity*' (22.8%; $p=0.28$) and '*not knowing why*' (20.2%; $p=0.76$). Fewer learners in 2008 did not have access to equipment/sporting grounds/gyms for physical activity than in 2002 (3.8%; $p=0.0001$), thus learners now have better access to facilities for physical activity than previously.

4. Time spent watching TV/playing video games

More learners in 2008 spent 2-4 hours/day watching TV/playing video games than in 2002 (2hours/day (17.5% vs 13.1%; $p=0.002$); 3hours/day (20.6% vs 17.1%; $p=0.02$); 4hours/day (13.5% vs 8.9%; $p<0.001$)). Fewer learners in 2008 did not watch TV/play video games than in 2002 (6.0% vs 10.4%; $p<0.001$).

5. Physical Education (PE) classes

When asked about the number of days in an average week in which PE classes were on the school timetable, fewer learners in 2008 did not have classes than in 2002 (28.6.% vs 47.0%; $p<0.001$), thus more learners were now having more frequent PE classes. More learners in 2008 had classes for 2-3days than in 2002 (2days (16.1%; $p<0.001$); 3days (13.6%; $p<0.001$).

Table 2: Proportions and comparative analysis of responses to the physical activity behavior questions (n=5) for the YRBS 2 (2008) and YRBS 1 (2002)

	YRBS 2 (2008) (n=1134)*	YRBS 1 (2002) (n=1379)*	[†] p-value
	n (%)	n (%)	
1. Past 7 day participation in vigorous activity for at least 20 min			
1. Did not take part in physical activity in the past week (7 days)	418 (36.9)	483 (35.0)	0.32
2. 1 day	203 (17.9)	221 (16.0)	0.20
3. 2 days	146 (12.9)	131 (9.5)	0.007
4. 3 days	103 (9.1)	138 (10.0)	0.45
5. 4 days	70 (6.2)	113 (8.2)	0.05
6. 5 days	34 (3.0)	95 (6.9)	<0.001
7. 6 days	27 (2.4)	43 (3.1)	0.29
8. Everyday	132 (11.6)	172 (12.5)	0.49
2. Past 7 day participation in moderate activity for at least 30 min			
1. Did not take part in physical activity in the past week (7 days)	328 (28.9)	321 (23.3)	0.001
2. 1 day	225 (19.8)	244 (17.7)	0.18
3. 2 days	153 (13.5)	172 (12.5)	0.46
4. 3 days	103 (9.1)	134 (9.7)	0.61
5. 4 days	69 (6.1)	84 (6.1)	1.00
6. 5 days	52 (4.6)	98 (7.1)	0.009
7. 6 days	29 (2.6)	51 (3.7)	0.11
8. Everyday	174 (15.3)	276 (20.0)	0.002
3. Main reason for not taking part in physical activity in the past 7 days			
1. Took part in physical activity in the past week (7 days)	412 (36.3)	509 (36.9)	0.76
2. Did not want to take part in physical activity in the past week (7 days)	259 (22.8)	290 (21.0)	0.28

3. Was ill	145 (12.8)	150 (10.9)	0.14
4. Felt unsafe, frightened and/or scared to go out to the ground/gym to take part in physical activity	46 (4.1)	52 (3.8)	0.70
5. Do not have the equipment/ground/gym to take part in physical activity	43 (3.8)	92 (6.7)	0.001
6. Don't know	229 (20.2)	285 (20.7)	0.76
4. Time spent on an average school day watching TV, playing video games or computer games			
1. 2 hours per day	198 (17.5)	181 (13.1)	0.002
2. 3 hours per day	234 (20.6)	236 (17.1)	0.025
3. 4 hours per day	153 (13.5)	123 (8.9)	<0.001
4. 5 or more hours per day	186 (16.4)	210 (15.2)	0.41
5. Do not have access to a TV, video or computer games	110 (9.7)	160 (11.6)	0.13
6. Do not watch TV, play video or computer games	68 (6.0)	143 (10.4)	<0.001
7. Less than 1 hour per day	184 (16.2)	279 (20.2)	0.01
5. No. of days in an average week in which physical education (PE) classes or 'sport' is on the school timetable			
1. Do not have PE classes or 'sport' on the school timetable	324 (28.6)	648 (47.0)	<0.001
2. 1 day	319 (28.1)	375 (27.2)	0.62
3. 2 days	183 (16.1)	90 (6.5)	<0.001
4. 3 days	154 (13.6)	94 (6.8)	<0.001
5. 4 days	70 (6.2)	83 (6.0)	0.84
6. Everyday	83 (7.3)	90 (6.5)	0.43

* total after discarding missing values

† 2 tailed, 2sample test of proportions

Stratified Analysis (Table 3)

A total of 432 (38%) learners did not participate in physical activity whilst 764 learners participated in physical activity in the previous 7 days.

1. Individual determinants

Females were more likely to be physically inactive in this study sample (OR=1.58; 95%CI: 1.23-2.03). Participants with a BMI <25kg/m² were less likely to be physically inactive (OR=0.90; 95%CI:0.65-1.22) compared to participants having a BMI >25kg/m² who were more likely to be

physically inactive (OR=1.12; 95%CI: 0.82-1.52) although both these results were not statistically significant.

2. Psychosocial determinants

a) Mood and Suicide

Feeling sad or hopeless and having seen a counsellor or doctor was positively associated with physical inactivity (OR=1.42; 95%CI:1.00-2.01). Participants who have admitted to considering suicide were also more likely (OR=1.23; 95%CI: 0.92-1.65) to be physically inactive.

b) Weight Perception

Participants who perceived their weight to be the normal were less likely to be physically inactive (OR=0.93; 95%CI:0.71-1.21). Participants who perceived themselves as fat/overweight were as likely to be physically active as physically inactive (OR=1; 95%CI: 0.70-1.45).

Those participants who perceived themselves overweight and admitted to not doing anything about their weight were more likely to be physically inactive (OR=1.49; 95%CI: 1.10-1.98), whereas those participants who were using only diet in an attempt to lose were also more likely to be physically inactive (OR=1.54; 95%CI: 1.10-2.14).

3. Socioeconomic Determinants

Participants who live in an urban or periurban area were more likely to be physically inactive (OR=1.49; 95%CI:1.07-2.09). Those participants living in a brick house and whose mothers are housewives were also more likely to be physically inactive, but these results were not statistically significant.

Participants receiving a large amount of pocket money, whose fathers were unemployed or both parents were employed for ≥ 5 /week were equally likely to physically inactive as physically active.

4. Environmental Determinants

Participants who had no PE classes in the school week were more likely to physically inactive (OR=2.22; 95%CI: 1.70-2.91). Those watching TV/playing video games <1hour/day were more

likely to be physically inactive (OR=1.42; 95%CI: 1.02-1.97) compared to those spending 2-5 hours/day. However these results were not statistically significant. An unsafe school and immediate surrounding environment was not associated with being physically inactive (unsafe school environment: OR= 0.82; 95%CI:0.61-1.09; unsafe immediate environment: OR=0.71; 95%CI: 0.51-0.97) , although these results were not statistically significant.

5. Health Risk Behaviours

Smoking and Drug Use

Participants who smoked cigarettes for ≥ 1 days in a month were significantly more likely to be physically inactive (OR=1.47; 95%CI: 1.15-1.89). Participants who had used marijuana ≥ 1 time in their lifetime were more likely to be physically inactive (OR=1.09; 95%CI:0.83-1.42).

Alcohol Related Behaviours

Participants who had at least 1 drink or 5/more drinks of alcohol in a row in the previous 30 days were equally likely to be physically inactive or physically active (OR=1.01; 95%CI:0.85-1.39) and OR=1.06; 95%CI:0.83-1.36 respectively). However, these results were not statistically significant. Learners who had at least 1 drink of alcohol at school in the previous 30 days were less likely to physically inactive (OR=0.73; 95%CI:0.49-1.07).

Violence Related Behaviours

Participants who carried a weapon during the previous 30 days in general and at school were less likely to be physically inactive (OR=0.70; 95%CI:0.51-0.96) and OR=0.68; 95%CI:0.42-1.08 respectively). Those learners who threatened/injured someone with a weapon or were in a physical fight in the previous 6 months were also less likely to be physically inactive (OR=0.79; 95%CI:0.51-1.20 and OR=0.69; 95%CI:0.53-0.90 respectively). Participants who had previous forced sex with another person were less likely to be physically inactive (OR=0.64; 95%CI:0.35-1.12)

Suicide

Participants who attempted suicide one or more times were less likely to be physical inactive (OR=0.97; 95CI:0.72-1.31). However these results were not statistically significant.

Risky Sexual Behaviour

Participants who had one/more sexual partners in the past 3 months or used alcohol before sex were marginally less likely to be physically inactive (OR=0.95; 95%CI:0.71-1.28 and OR=0.95; 95%CI:0.68-1.33 respectively). However these results were not statistically significant. Learners who did not use contraception for pregnancy during sex were more likely to physically inactive (OR=1.15; 95%CI:0.72-1.81). In contrast, those participants that used condoms during sex were significantly less likely to be physically inactive (OR=0.65; 95%CI:0.46-0.9). Participants who ever had an STD were less likely to be physically inactive (OR=0.87; 95%CI=0.38-2.09).

Table 3: Stratified analysis of individual, psychosocial, socioeconomic, environmental and other risk behaviour variables by physically inactive (n=432) and physically active (n=764) YRBS 2 groups*

	Physically Inactive			Physically Active					
OUTCOME VARIABLE	total	n	%	total	n	%	OR	95% CI:LL	95% CI:UL
INDIVIDUAL									
Female	430	273	63.2	760	398	52.1	1.58	1.23	2.03
BMI <25 (kg/m2)	420	333	84.5	744	603	78.9	0.90	0.65	1.22
BMI >25 (kg/m2)	420	87	20.7	744	141	18.5	1.12	0.82	1.52
PSYCHOSOCIAL									
felt sad/hopeless and saw Dr/counsellor	423	71	16.8	747	93	12.4	1.42	1.00	2.01
considered suicide	422	106	25	740	158	20.7	1.23	0.92	1.65
perception of wt - about the right wt	362	193	53.3	636	351	55.2	0.93	0.71	1.21
perception of wt - fat/overweight	362	58	16	636	102	16.0	1.00	0.70	1.45
not trying to do anything about wt	425	111	26.2	736	142	19.3	1.49	1.10	1.98

SOCIOECONOMIC STATUS									
live in a brick house	430	323	75	759	553	72.4	1.12	0.84	1.48
live in an urban /periurban area	299	227	76	538	365	68	1.49	1.07	2.09
receive pocket money > R70/month	431	125	28.9	758	218	28.5	1.01	0.77	1.32
father works $\geq 5x$ week	379	244	64.4	666	424	63.7	1.03	0.79	1.35
father is unemployed	379	36	9.5	666	61	9.2	1.04	0.66	1.63
mother works $\geq 5x$ week	405	194	47.9	709	337	47.5	1.01	0.79	1.30
mother is a housewife	405	107	26.4	709	173	24.4	1.11	0.83	1.48
ENVIRONMENTAL									
1-5days of school missed due to feeling unsafe at school	429	91	21.3	762	189	24.8	0.82	0.61	1.09
1-5days of school missed due to feeling unsafe going to/from school	429	71	16.6	762	167	21.9	0.71	0.51	0.97
bullied in some form at school	429	176	41.0	759	312	41.1	1.00	0.78	1.29
watching TV/playing computer games <1hr/day	420	81	19.3	721	104	14.4	1.42	1.02	1.97
watching TV/playing computer games 2-5 hrs/day	420	275	65.5	721	501	69.5	0.83	0.64	1.09
no PE classes in the school week	426	167	39.2	734	165	22.5	2.22	1.70	2.91
HEALTH RISK BEHAVIOURS									
times smoked cigarettes 1 or more days in a month	428	192	44.8	759	270	35.6	1.47	1.15	1.89
ever used marijuana >1 time in lifetime	429	301	70.2	759	519	69.6	1.09	0.83	1.42
had at least 1 drink of alcohol in the past 30 days	426	223	52.3	752	378	50.2	1.01	0.85	1.39
had 5/more drinks of alcohol in a row in the past 30 days	428	173	40.4	755	294	38.9	1.06	0.83	1.36
had at least 1 drink of alcohol days at school in the past 30 days	429	45	10.4	760	105	13.8	0.73	0.49	1.07
carried a weapon in the past 30 days	428	29	6.7	760	73	9.6	0.70	0.51	0.96

carried a weapon in school in the past 30 days	430	29	6.7	760	73	9.6	0.68	0.42	1.08
threatened/injured someone with a weapon in the past 6 months	426	37	8.6	751	81	10.79	0.79	0.51	1.2
in a physical fight in past 6 months	427	117	27.4	760	268	35.26	0.69	0.53	0.9
forced sex with another person	420	19	4.5	741	51	6.88	0.64	0.35	1.12
attempted suicide ≥ 1 times	430	91	21.2	761	165	21.7	0.97	0.72	1.31
had 1/more sexual partners in the past 3 months	425	91	21.4	752	167	22.21	0.95	0.71	1.28
used alcohol before sex	423	67	15.8	746	123	16.49	0.95	0.68	1.33
did not use contraception for pregnancy during sex	425	36	8.4	751	56	7.46	1.15	0.72	1.81
used condoms during sex	425	63	14.8	751	159	21.17	0.65	0.46	0.9
ever had an STD	428	10	2.3	746	19	2.55	0.91	0.38	2.09

*abbreviations: OR: odds ratio, CI: confidence interval, LL: lower limit, UL: upper limit

Discussion

Overall, significantly younger students participated in the YRBS 2 than in the YRBS 1 (table 1). A possible explanation for this could be an improvement in the schooling system in the Western Cape resulting in the appropriate aged learners being assigned to the correct grade.

Comparative analysis between YRBS 2 and YRBS 1

Overall, fewer learners in Grades 8-11 in the Western Cape in 2008 participated in vigorous and moderate physical activity within the previous 7 days than in 2002. Also, those learners in 2008 that participated in vigorous and moderate physical activity did so less frequently than in 2002 (table 2).

The main reported reasons for not participating in physical activity in the 2008 learners did not change from the 2002 learners from not wanting to participate and not knowing why they did not participate. This suggests that regular physical activity may not be considered an important priority for these learners and thus, could be a potential point of intervention for

targeting physical inactivity in adolescents.

Access to facilities did not seem to be a potential barrier to physical activity as more learners have access to sporting equipment/grounds/gyms than in 2002. However, their lower reported participation in physical activity in 2008 compared to 2002 suggests that these learners do not appear to be utilising these facilities.

Overall, more learners in 2008 were spending more time (2-4 hours/day) in an average school day watching TV/playing video games than learners in 2002. This can be attributed to the wider availability and lower cost of televisions and home video game consoles than in the past.

More learners in 2008 have the opportunity to participate in physical activity at school in the form of more frequent PE classes during the week than learners in 2002. Given that PE classes are more prevalent than previously and the decreased reported levels of physical activity, it is possible that students may not have considered their compulsory PE classes as vigorous or moderate physical activity when questioned in the survey.

These findings were consistent with results of the longitudinal study on US adolescents where the number of PE classes per week was not associated with level of inactivity of adolescents¹⁰.

Stratified analysis of physically inactive vs physically active

More females were physically inactive in the YRBS 2 and this is in keeping with previous literature findings suggesting that gender based socialisation may be reflected in physical activity behaviours¹⁵.

In summary, the statistically significant characteristics of the physically inactive group included (table 3): being female, feeling sad/hopeless and having consulted a health professional, perceiving themselves as overweight and admitting to not doing anything about it, living in an urban/periurban area, having no PE classes at school, watching TV/playing computer games <1hr/day and having smoked cigarettes for 1 or more days in a month. Thus the above characteristics can be viewed as barriers to physical activity and participants with these characteristics were more likely to be physically inactive.

Other characteristics that were positively associated with physical inactivity but were not statistically significant were: having a BMI > 25kg/m², having considered suicide, living in a

brick house, having a lifetime use of marijuana more than once, had 5/more drinks of alcohol in a row in the previous 30 days and not using contraception for pregnancy during sex.

From a socioeconomic perspective, living in a brick house in an urban area appeared to place the learners at greater “risk” of physical inactivity and is in keeping with previous findings observed in rural school children⁹. However, family income and pocket money did not appear to influence physical activity directly despite previous findings to the contrary¹⁰. It is likely that income was inaccurately reported by participants.

From the other health risk behaviour perspective, smoking and other substance use, including alcohol generally appeared to be associated with physical inactivity. However, violence related behaviours appeared to less likely to be associated with physical inactivity. Risky sexual behaviours, in general, also appeared to be less likely associated with physical inactivity.

Limitations

The cross-sectional design of this study precludes establishing a temporal and causal relationship between physical activity levels and health behaviours. Longitudinal studies are needed to accurately explore the temporal relationships and causal associations of types and levels of physical activity and other health behaviours of adolescents

Data collected was self-reported by learners without corroboration from other sources, resulting in a self-report/recall bias. Attempts to overcome this bias included allowing anonymous and voluntary participation without teacher presence⁶.

The main disadvantage of using a stratified cluster sampling method over a simple random sample was that estimates are less precise from a sample of the same size. However, the advantages are that this method is more cost effective and reduces the sampling frame data requirements. Due to the South African population being geopolitically and socially uneven, having clusters at both stages of sampling (at a school and class level) was the most feasible method to ensure representativeness.

Conclusion

Fewer adolescents in Grade 8-11 in the selected public schools in the Western Cape in 2008 participated in vigorous and moderate physical activity within the previous 7 days than adolescents in 2002. Also, those learners in 2008 that participated in vigorous and moderate physical activity were doing so less frequently than in 2002. Environmental determinants such as school PE classes and TV watching/video game playing; and socioeconomic status determinants such as living in an urban area, appeared to have the strongest influence on physical inactivity of these adolescents. These determinants could be potential target areas for future interventions to improve physical activity behaviours of adolescents.

Conflicts of Interest

Funding for the YRBS 2 was provided by the MRC of South Africa. All authors acknowledge that there is no conflict of interest.

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PART D: Appendices

Appendix 1: Questionnaire

Selected Relevant Sections from the YRBS 2 Questionnaire

Section A: Demographic Information

1. Are you a boy (man) or a girl (woman)?

- a. boy (man)
- b. girl (woman)

2. In what grade are you?

- a. Grade 8
- b. Grade 9
- c. Grade 10
- d. Grade 11

3. What is your race group?

- a. Black
- b. Coloured
- c. Indian
- d. White
- e. Other

4. What type of dwelling do you live in?

- a. A brick house
- b. An apartment / flat
- c. A shack
- d. A hut
- e. A house made of mud and stick
- f. A house made of mud bricks and thatch
- g. Other

5. How would you describe the area you live in?

- a. A rural area
- b. An urban area
- c. A peri-urban area
- d. I don't know

6. **In a normal / usual month (30 days), how much pocket money or allowance do you get?**
- a. I don't get any pocket money or allowance
 - b. Less than R20. 00
 - c. From R21.00 to R30.00
 - d. From R31.00 to R40.00
 - e. From R41.00 to R50.00
 - f. From R51.00 to R60.00
 - g. From R61.00 to R70.00
 - h. More than R70.00
7. **Does your father (male guardian) have a paid job? (Paid job also refers to those who are self-employed e.g. your father has a shop at home)**
- a. Yes, works 5 or more days a week
 - b. Yes, works less than 5 days a week
 - c. No, gets a social grant
 - d. No, is unemployed
 - e. No, is ill or disabled
 - f. No, has retired
 - g. My father is deceased
 - h. I don't know
8. **Does your mother (female guardian) have a paid job? (Paid job also refers to those who are self-employed e.g. your mother has a shop at home)**
- a. Yes, works 5 or more days a week
 - b. Yes, works less than 5 days a week
 - c. No, gets a social grant
 - d. No, is a housewife
 - e. No, is ill or disable
 - f. No, has retired
 - g. My mother is deceased
 - h. I don't know

Section B: Violence-related behaviour
--

1. **During the past month (30 days), on how many days did you not go to school (miss school) because you felt you would be unsafe at school ?**
- a. 0 days
 - b. 1 day
 - c. 2 or 3 days
 - d. 4 or 5 days
 - e. 6 or more days

2. **During the past month (30 days), on how many days did you not go to school (miss school) because you felt you would be unsafe on your way to or from school?**
- 0 days
 - 1 day
 - 2 or 3 days
 - 4 or 5 days
 - 6 or more days
3. **During the past month (30 days), what was the one way in which you were bullied the most? (Select only one response)**
- I was never bullied
 - I was called mean names, was made fun of, or was teased in a hurtful way
 - I was hit, kicked, pushed, shoved around or locked indoors
 - Others told lies or spread false rumours about me and tried to make people dislike me
 - I was made fun of because of my race or colour
 - I was made fun of because of my religion
 - I was bullied because of my weight (underweight or overweight)
 - I was bullied in some other way
4. **During the past month (30 days), how often did you carry a weapon such as a gun, knife, panga or kierrie?**
- Never (0 days)
 - Rarely (1 day)
 - Sometimes (2 or 3 days)
 - Often (4 or 5 days)
 - Very often (6 or more days)
5. **During the past month (30 days), how often did you carry a weapon such as a gun, knife, panga or kierrie while at school?**
- Never (0 days)
 - Rarely (1 day)
 - Sometimes (2 or 3 days)
 - Often (4 or 5 days)
 - Very often (6 or more days)
6. **During the past 6 months, how often have you threatened or injured someone with a weapon such as a gun, knife, panga, or kierrie at school?**
- Never (0 times)
 - Rarely (1 time)
 - Sometimes (2 or 3 times)
 - Often (4 or 5 times)
 - Very often (6 or more times)

7. **During the past 6 months, how often were you in a physical fight (e.g. punching, hitting)?**
- a. Never (0 times)
 - b. Rarely (1 time)
 - c. Sometimes (2 or 3 times)
 - d. Often (4 or 5 times)
 - e. Very often (6 or more times)
8. **Have you ever physically forced someone to have sex (when the penis enters the vagina or anus) when he/she did not want to?**
- a. Yes
 - b. No

Section C: Sad feelings and attempts at suicide
--

1. **During the past 6 months, have you ever felt so sad or hopeless that you stopped doing some usual activities for two weeks or more in a row?**
- a. Yes
 - b. No
 - c. I don't know
2. **During the past 6 months, have you ever felt so sad or hopeless that you needed to seek treatment from a doctor, counsellor or clinic?**
- a. Yes
 - b. No
3. **During the past 6 months, did you ever seriously consider attempting suicide (that is take some action to end your life)?**
- a. Yes
 - b. No
4. **During the past 6 months, how many times did you actually attempt suicide (that is take some action to end your life)?**
- a. 0 times
 - b. 1 time
 - c. 2 or 3 times
 - d. 4 or 5 times
 - e. 6 or more times

Section D: Smoking

- 1. During the past month (30 days), on how many days did you smoke cigarettes?**
- a. 0 days
 - b. 1 or 2 days
 - c. 3 to 5 days
 - d. 6 to 9 days
 - e. 10 to 19 days
 - f. 20 to 29 days
 - g. All 30 days

Section E: Marijuana use

- 1. During your life, how often have you used dagga / hashish (marijuana)?**
- a. Never (0 times)
 - b. Rarely (1 or 2 times)
 - c. Sometimes (3 to 9 times)
 - d. Often (10 to 19 times)
 - e. Very often (20 or more times)

Section F: Body weight

- 1. How would you describe your weight?**
- a. Very underweight (very thin)
 - b. Slightly underweight (thin)
 - c. About the right weight
 - d. Slightly overweight (fat)
 - e. Very overweight (very fat)
 - f. I don't know
- 2. Which of the following are you trying to do about your weight?**
- a. Lose weight
 - b. Gain weight
 - c. Stay the same weight
 - d. I am not trying to do anything about my weight
- 3. During the past month (30 days), which one of the following did you do the most to lose weight or to keep from gaining weight? (Select only one response)**
- a. Exercise
 - b. Eat less food, fewer calories, or foods low in fat
 - c. Go without eating for 24 hours or more (also called fasting)
 - d. Take any diet pills, powders, or liquids without a doctor's advice
 - e. Vomit
 - f. Take laxatives
 - g. None of the above
 - h. All or some of the above

Section G: Physical activity

- 1. In the past week (7 days), how often did you exercise or participate in physical activity for at least 20 minutes, such as soccer, netball, rugby, basketball or running?**
 - a. I did not take part in physical activity in the past week (7 days)
 - b. 1 day
 - c. 2 days
 - d. 3 days
 - e. 4 days
 - f. 5 days
 - g. 6 days
 - h. everyday

- 2. In the past week (7 days), what was the main reason for you not to take part in physical activity? (Select only one response)**
 - a. I took part in physical activity in the past week (7 days)
 - b. I did not want to take part in physical activity in the past week (7 days)
 - c. I was ill
 - d. I felt unsafe, frightened and/or scared to go out to the ground / gym to take part in physical activity
 - e. I do not have the equipment / ground / gym to take part in physical activity
 - f. I don't know

- 3. In the past week (7 days), how often did you participate in physical activity for at least 30 minutes, such as fast walking, slow bicycling, skating, pushing a lawn mower, mopping, polishing or sweeping the floors?**
 - a. I did not take part in physical activity in the past week (7 days)
 - b. 1 day
 - c. 2 days
 - d. 3 days
 - e. 4 days
 - f. 5 days
 - g. 6 days
 - h. Everyday

- 4. On an average school day, how much time do you spend watching TV, playing video games or computer games?**
 - a. I do not watch TV, play video games or computer games on an average school day
 - b. Less than 1 hour per day
 - c. 1 hour per day
 - d. 2 hours per day
 - e. 3 hours per day
 - f. 4 hours per day
 - g. 5 or more hours per day
 - h. I do not have access to a TV, video games or computer games

5. In an average week when you are in school, on how many days do you have physical education (PE) classes or 'sport' on your school timetable?
- We do not have physical education (PE) classes or 'sport' on our school timetable
 - 1 day
 - 2 days
 - 3 days
 - 4 days
 - everyday
6. During an average physical education (PE) class or 'sport' class, which one of the following activities do you mainly do? (Select only one response)
- We do not have physical education classes or 'sport'
 - soccer
 - running
 - rugby
 - netball / basketball/cricket
 - life-skills education or class discussion
 - other activities

Section H: Alcohol Use

1. During the past month (30 days), how often did you have at least one drink of alcohol (e.g. a beer, a glass of wine, or a 'tot' of brandy)?
- Never (0 days)
 - Rarely (1 to 5 days)
 - Sometimes (6 to 9 days)
 - Often (10 to 19 days)
 - Very often (20 to 30 days)
2. During the past month (30 days), how often did you have 5 or more drinks of alcohol (e.g. a beer, a glass of wine, or a 'tot' of brandy) in a row, that is, within a couple of hours?
- Never (0 days)
 - Rarely (1 to 5 days)
 - Sometimes (6 to 9 days)
 - Often (10 to 19 days)
 - Very often (20 to 30 days)
3. During the past month (30 days), how often did you have at least one drink of alcohol (e.g. a beer, a glass of wine, or a 'tot' of brandy) at school during school time?
- Never (0 days)
 - Rarely (1 to 5 days)
 - Sometimes (6 to 9 days)
 - Often (10 to 19 days)
 - Very often (20 to 30 days)

Section I: Sexual Behaviour

1. **During the past 3 months, with how many people did you have sex (when the penis enters the vagina or anus)?**
 - a. I have never had sex
 - b. I have had sex, but not during the past 3 months
 - c. 1 person
 - d. 2 people
 - e. 3 or more people

2. **The last time you had sex (when the penis enters the vagina or anus), did you drink alcohol before you had sex?**
 - a. I have never had sex
 - b. Yes
 - c. No
 - d. I do not remember

3. **When you have sex (when the penis enters the vagina or anus), what one method did you or your partner mostly use to prevent pregnancy? (Select only one response.)**
 - a. I have never had sex
 - b. No method was used to prevent pregnancy
 - c. Birth control pills
 - d. Condoms
 - e. Injection (e.g. Depo-Provera)
 - f. Withdrawal (penis removed from the vagina before ejaculation)
 - g. Morning after pill
 - h. Some other method

4. **Have you ever had a sexually transmitted infection (STI e.g. 'idrop', discharge)?**
 - a. I have never had sex
 - b. I do not know what an STI is
 - c. No, I have never had a sexually transmitted infection (STI)
 - d. Yes, I have had a sexually transmitted infection (STI)
 - e. I don't know

Appendix 2: Participant Information Form and Consent Form

2(a) Participant Information Form

LEARNER INFORMATION SHEET

The Second National Youth Risk Behaviour Survey (YRBS)

Dear Learner and Parent

INTRODUCTION

The Health Promotion Research and Development Unit of the Medical Research Council (MRC) is conducting a survey amongst learners in Grades 8, 9, 10 and 11 in South Africa. This is a countrywide study that will be conducted in all nine provinces of South Africa involving approximately 251 schools. The Department of Health and Education as well as your/your child's school principal has allowed us to work in your/your child's school. As your/ your child's class has been chosen to form part of the study. You/ your child is invited to participate in this research study. This information leaflet is to help you/your child decide if you/ your child would like to take part in the study. Before agreeing to take part in the study, you/your child should understand fully what is involved. You should not agree to take part in the study unless you/ your child is completely happy about all the procedures involved.

PURPOSE OF THE STUDY

The purpose of this study is to collect information about the various behaviours that place adolescent's health at risk, e.g. tobacco use, alcohol use and drug use. This information will be used to develop better health education programs for young people. You/your child will be required to complete a self-administered questionnaire. In addition, two of the questions in the study require the measurement of height and weight of each participant in the study. Trained personnel will take the measurements. You/ your child will be asked to take off your/their shoes and jacket for the measurements to be taken.

DURATION OF THE STUDY

If you/ your child decide to take part, you/ your child will be asked to fill in a brief questionnaire that will take about 60 minutes to complete.

HAS THE STUDY RECEIVED ETHICAL APPROVAL

The study has received ethical approval from the South African Medical Association Research Ethics Committee.

PARTICIPANTS RIGHTS DURING THE STUDY

Participation in the study is voluntary (you/ your child does not have to take part). If you/ your child agree to participate, you/your child are free to withdraw from the study at any time if you feel uncomfortable or do not like the questions being asked. You/ your child do not have to explain why you want to withdraw from the study and will not be disadvantaged in any way for withdrawing at any time.

SOURCES OF ADDITIONAL INFORMATION

If you have any questions or need more information, please feel free to contact:

Dr S. James or Dr Nasheen Naidoo

Health Promotion Research and Development Unit

Medical Research Council

Tel no: (033) 387 7443

Fax no: (033) 387 2107

E-mail: shags.james@mrc.ac.za; Nasheen.Naidoo@mrc.ac.za

Should you require help with any problem that you are currently dealing with e.g. drug use or alcohol use etc. please contact the Youth Line at: 08000 00001

CONFIDENTIALITY

The completed answer sheet will be placed in an envelope and sealed. Only the research team will see this information. The Principal, parents, teachers, relevant departments and fellow learners will not see the answers that you/your child have given. You/your child do not have to write your name on the answer sheet. No school or learner's name will be mentioned in any report of the results. All the information obtained will be treated confidentially.

2(b) Consent Form

INFORMED CONSENT FORM

I hereby confirm that I have been informed by the Principal Investigator about the nature and purpose of the YRBS. I have also received, read and understood the above written information (Learner Information Leaflet and Informed Consent) regarding the study. I am aware that the results of the study, including personal details regarding my/my child's sex, and age will be anonymously processed into a study report.

I may, at any stage, without being disadvantaged, withdraw my/my child's consent and participation in the study.

I have had sufficient opportunity to ask questions and declare myself/my child prepared to participate in the study.

Name of participant:

_____	_____	_____
Printed Name	Signature	Date

Name of parent/guardian:

_____	_____	_____
Printed Name	Signature	Date

Witness:

_____	_____	_____
Printed Name	Signature	Date

Prof. Priscilla Reddy
Principal Investigator: YRBS

Dr S. James
Project Director: YRBS

APPENDIX 3: Letter of approval from Research Ethics Committee



UNIVERSITY OF CAPE TOWN

Health Sciences Faculty
Research Ethics Committee
Room E52-24 Groote Schuur Hospital Old Main Building
Observatory 7925
Telephone [021] 406 6338 • Facsimile [021] 406 6411
e-mail: sumayah.ariefdien@uct.ac.za

15 February 2010

REC REF: 029/2010

Prof SP Reddy
Health Promotion MRC

Dear Prof Reddy

PROJECT TITLE: PHYSICAL ACTIVITY BEHAVIORS IN SCHOOL-GOING ADOLESCENTS IN THE WESTERN CAPE PROVINCE, SOUTH AFRICA.

Thank you for submitting your study to the Research Ethics Committee for review

It is a pleasure to inform you that the Ethics Committee has **formally approved** the above-mentioned study

Approval is granted for one year till the 20th February 2011.

Please submit an annual progress report (FHS016) if the research continues beyond the expiry date. Alternatively please submit a study closure report (FHS 010) if the study is completed within one year so that we can close our file.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the REC. REF in all your correspondence.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, HSE HUMAN ETHICS

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

This serves to confirm that the University of Cape Town Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP) and Declaration of Helsinki guidelines.

The Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

APPENDIX 4: Instructions for Authors – South African Medical Journal (SAMJ)

<http://www.samj.org.za/index.php/samj/about/submissions#authorGuidelines>

Author Guidelines

COPYRIGHT

Material submitted for publication in the South African Medical Journal (SAMJ) is accepted provided it has not been published elsewhere. The SAMJ reserves copyright of the material published.

The SAMJ does not hold itself responsible for statements made by the authors.

AUTHORSHIP

All named authors must give consent to publication. Authorship should be based only on substantial contribution to: (i) conception, design, analysis and interpretation of data; (ii) drafting the article or revising it critically for important intellectual content; (iii) final approval of the version to be published. All three of these conditions must be met (Uniform requirements for manuscripts submitted to biomedical journals; www.icmje.org/index.html).

RESEARCH ETHICS COMMITTEE APPROVAL

Evidence must be provided of Research Ethics Committee approval of the research where relevant.

CONFLICT OF INTEREST

Authors must declare all sources of support for the research and any association with the product or subject that may constitute conflict of interest.

PROTECTION OF PATIENT'S RIGHTS TO PRIVACY

Identifying information should not be published in written descriptions, photographs, and pedigrees unless the information is essential for scientific purposes and the patient (or parent or guardian) gives informed written consent for publication. Informed consent for this purpose requires that the patient be shown the manuscript to be published. (www.icmje.org)

ETHNIC CLASSIFICATION

Work that is based on or contains reference to ethnic classification must indicate the rationale for this.

MANUSCRIPTS

Short items are more likely to appeal to our readers and therefore to be accepted for publication.

Original articles of 3 000 words or less, with up to 6 tables or illustrations, should normally report observations or research of relevance to clinical medicine. References should preferably be limited to no more than 15.

Short reports or scientific letters, which include case reports (the SAMJ is rarely able to publish case reports), side effects of drugs and brief or negative research findings should be 1000 words or less, with 1 table or illustration and no more than 6 references.

Editorials, Opinions, Issues in Medicine, etc. should be about 800 words and are welcome,

but unless invited, will be subjected to the SAMJ peer review process.

Review articles are rarely accepted unless invited.

Letters to the editor, if intended for the correspondence column should be no longer than 400 words with only one illustration or table.

Obituaries should not exceed 400 words and may be accompanied by a photograph.

MANUSCRIPT PREPARATION

Research articles should have a structured abstract not exceeding 250 words (50 for short reports) comprising: Objectives, Design, Setting, Subjects, Outcome measures, Results and Conclusions.

Refer to articles in recent issues for guidance on the presentation of headings and subheadings.

Abbreviations should be spelt out when first used in the text and thereafter used consistently. Scientific measurements should be expressed in SI units except: blood pressure should be given in mmHg and haemoglobin values in g/dl.

If in doubt, refer to 'uniform requirements' above.

ILLUSTRATIONS

Figures consist of all material that cannot be set in type, such as photographs and line drawings. If any tables or illustrations submitted have been published elsewhere, the author should obtain written consent to republication from the copyright holder and the author(s). All illustrations, figures etc. must be of high resolution/quality, preferably jpeg or equivalent but not powerpoint, and preferably attached as supplementary files.

REFERENCES

References should be inserted in the text as superior numbers and should be listed at the end of the article in numerical and not in alphabetical order.

Authors are responsible for verification of references from the original sources.

References should be set out in the Vancouver style and approved abbreviations of journal titles used; consult the List of Journals in Index Medicus for these details.

Names and initials of all authors should be given unless there are more than six, in which case the first three names should be given followed by et al. First and last page numbers should be given.

Journal references should appear thus:

Price NC . Importance of asking about glaucoma. BMJ 1983; 286: 349-350.

Book references should be set out as follows:

Jeffcoate N. Principles of Gynaecology. 4th ed. London: Butterworth, 1975: 96-101.

Weinstein L, Swartz MN. Pathogenic properties of invading microorganisms. In: Sodeman WA jun, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974: 457-472.

Manuscripts accepted but not yet published can be included as references followed by (in

press).

Unpublished observations and personal communications may be cited in the text, but not in the reference list

PROOFS

Proofs will be forwarded to the author before publication and if not returned within 2 weeks will be regarded as approved. Alterations at this stage are costly and may be charged to the authors.

CHANGES OF ADDRESS

Please notify the Editorial Department of any address changes so that proofs etc. may be sent without delay.

CPD POINTS

Authors can earn up to 15 CPD points for published articles. Certificates may be requested after publication of the article.

Submission Preparation Checklist

As part of the submission process, authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to these guidelines.

1. The submission has not been previously published, nor is it before another journal for consideration (or an explanation has been provided in Comments to the Editor).
2. The submission file is in Microsoft Word or RTF document file format.
3. When available, the URLs to access references online are provided, including those for open access versions of the reference. The URLs are ready to click (e.g., <http://pkp.sfu.ca>).
4. The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses). Figures consist of all material that cannot be set in type, such as photographs and line drawings. If any tables or illustrations submitted have been published elsewhere, the author should obtain written consent to republication from the copyright holder and the author(s). All illustrations, figures etc. must be of high resolution/quality, preferably jpeg or equivalent but not powerpoint, and preferably attached as supplementary files.
5. The text adheres to the stylistic and bibliographic requirements in Author Guidelines, which is found in About the Journal.
6. Research Ethics Committee approval was obtained for the research (this should be indicated in the text of the paper).
7. Authors must indicate any conflict of interest (or competing interests).

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